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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/731,246	12/10/2003	Seok-Kyu Lee	053933-5059	5700
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MORGAN LEWIS & BOCKIUS LLP 1111 PENNSYLVANIA AVENUE NW WASHINGTON, DC 20004			EXAMINER PATEL, ISHWARBHAI B	
			ART UNIT 2841	PAPER NUMBER
DATE MAILED: 09/07/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

**Office Action Summary**

Application No.

10/731,246

Applicant(s)

LEE ET AL.

Examiner

Ishwar (I. B.) Patel

Art Unit

2841

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 1-16 and 23-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 17-20 and 22 is/are rejected.
- 7) ☒ Claim(s) 21 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 12/10/2003.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election of group II, claims 17-22 in the reply filed on July 27, 2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

### *Specification*

2. The abstract of the disclosure is objected to because of the following confusing description:

On page 21, in describing figure 6, 103a and 103b, line 2 and line 16, are described as "**polymer capacitor paste**", where as on page 22, line 8 and 9, both 103a and 103b are described as first core layer and second core layer, as described as made of **FR4 material** (page 22, line 25 and page 23, line 1. Further, on page 22, line 12-13, element 105a and 105b are referred to as **capacitor paste** and subsequently at various locations, page 23, line 6-7, line 17-18, page 25, line 11-12, elements 105a and 105b are referred to as capacitor paste. It appears one of the group of reference numerals, either 103a-103b or 105a-105b, is referred incorrectly.

Correction is required. See MPEP § 608.01(b).

### ***Claim Objections***

3. Claims 17-22 are objected to because of the following informalities: References (a), (b) .... (g), used in describing claim 17, are not required and may be removed as they are not part of the description.

Claims 18-22 depend upon claim 17.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kusagaya et al., US Patent Application Publication Number 2003/0063453 (Kusagaya) in view of Kuwako et al. US Patent No. 6,693,793 (Kuwako).

**Regarding claim 17**, Kusagaya in figure 7, discloses a printed circuit board with embedded capacitors, comprising: an inner layer of a multi-layered printed circuit board having a copper clad laminate adhered thereon by means of an adhesive (L4, as shown in detail in figure 1, described at paragraph 0071 in detail); a ground layer copper foil (L2, shown in detail in figure 1), formed at a top and a bottom of the -inner layer; a polymer film (16) having a predetermined thickness and formed on the ground layer

copper foil, a power layer (L3, as shown in detail in figure 1) copper foil formed on the polymer film, an insulation layer attached copper film (48) formed on the power layer copper foil (14 and 48, figure 5), etched to desired partition; a blind via-hole (18) and a through-hole (20) formed at predetermined portions of the insulation layer-attached copper film; and plated layers of the blind via-hole and the through-hole for layer connection of the printed circuit board.

Kusagaya does not disclose the ground layer copper foil with roughened surface and the polymer film made of capacitor paste having high dielectric constant.

Kuwako, in figure 1, discloses a doubled sided copper clad laminate for capacitor layer formation with roughened (14) surface for better adhesion, column 5, line 35-50.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the circuit board of Kusagaya with the ground layer copper foil with roughened surface, as taught by Kuwako, in order to have better adhesion.

Regarding the polymer film made of paste having high dielectric constant. Kusagaya discloses the polymer film (16) provided between the ground layer and power layer made of polyimide film, but is silent about the dielectric constant of the polymer film. However, Kusagaya further states that the combination of ground layer, polymer layer and power layer, is used as a condenser body, page 2, paragraph 0028. It is known (scientifically) in the art that the capacity (capacitance) of the condenser will depend upon the dielectric constant of the polymer (insulation) between the conductive layers (power and ground layers). Further, it has been held that discovering an optimum

Art Unit: 2841

value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the circuit board of Kusagaya with the polymer layer between the ground layer and the power layer formed of high dielectric constant, in order to have the desired capacitor (condenser) capacity.

**Regarding claim 18**, the modified circuit board of Kusagaya further discloses the insulation layer-attached copper film is a resin-coated copper foil (14-48, figure 6).

**Regarding claim 19**, the modified circuit board of Kusagaya further discloses the surface of the ground layer copper foil is roughened at a thickness of 1-2  $\mu\text{m}$  to increase a bonding force between the ground layer copper foil and the capacitor paste (Kuwako, claim 4).

6. Claims 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Kusagaya and Kuwako, as applied to claim 17 above, and further in view of Bruno et al., US Patent No. 5,155,072 (Bruno).

**Regarding claim 20**, the combination of Kusagaya and Kuwako discloses all the features of the claimed invention as applied to claim 17 above, but does not disclose the capacitor mixture is in a mixed composite form of  $\text{BaTO}_3$  ceramic powders having high-dielectric constant of 1000-10,000 and polyimide.

Bruno discloses a high dielectric composition having BaTO<sub>3</sub> with a dielectric constant of at least 10,000 for electric device such as capacitors. Further, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the modified circuit board of Kusagaya with the capacitor paste in a mixed composite form of BaTO<sub>3</sub> ceramic powders having high-dielectric constant of 1000-10,000 and polyimide, as taught by Bruno, in order to have the desired capacitance value.

**Regarding claim 22**, the combination of Kusagaya and Kuwako discloses all the features of the claimed invention as applied to claim 17 above, but does not disclose the capacitor paste is coated at a thickness of 8-25  $\mu\text{m}$ . However, it is scientifically known in the art that the capacitance of a capacitor will depend upon the dielectric constant and the thickness of the insulating layer between the two conductive layer and the desired value can be obtain by a specific combination of the dielectric constant and thickness of the insulating layer. Further, it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the modified circuit board of Kusagaya with

Art Unit: 2841

the capacitor paste coated with a thickness of 8-25  $\mu\text{m}$ , in order to have desired capacitance value.

***Allowable Subject Matter***

7. Claim 21 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, including the claim objection.

8. The following is statement of reasons for the indication of allowable subject matter:

A printed circuit board with embedded capacitors with the limitation "the capacitor paste is a polymer ceramic composite having a dielectric constant of 80-90 by uniformly dispersing BaTiO<sub>3</sub> powders comprising bimodal micropowders of 0.9  $\mu\text{m}$  in diameter and 60 nm in diameter mixed at a volume ratio of 3:1-5:1 into an epoxy resin" in conjunction with other claimed limitation has not been disclosed or suggested by prior art of record.

***Conclusion***

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.




Appelt et al., in figure 6, discloses a printed circuit board with capacitive elements (14).

Hoffarth et al., in figure 1A, discloses a printed circuit board with capacitors 22A and 22B formed within the circuit board.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ishwar (I. B.) Patel whose telephone number is (571) 272 1933. The examiner can normally be reached on M-F (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on (571) 272 1957. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Ishwar (I. B.) Patel  
Examiner  
AU: 2841  
September 1, 2005.